

Serial No. 10/066,533
Docket No. UVD 0276 PA/40815.372

REMARKS

Claims 1-44 were pending. Claims 1-2, 9, 11-14, 22, 24-26, and 34-35 have been amended. As a result of this amendment, claims 1-44 remain pending. Reexamination and reconsideration are requested in light of the accompanying amendments and remarks.

Claims 12 and 25 have been amended to correct the grammar to "an organic compound containing a group." This amendment has been made for purposes of clarity and for no other purpose. It does not narrow the claims.

The objection to claims 22-24 as being substantial duplicates of claims 9-11 has been overcome as a result of the correction of the dependency of claim 22 from claim 1 to claim 18.

The rejection of claims 1, 13, and 26 under 35 U.S.C. § 112, second paragraph as being indefinite has been overcome. Claims 1-2, 9, 11-14, 22, 24-26, and 34-35 have been amended to recite that the soluble precipitating reagent is a "low toxicity precipitating reagent." Support for these amendments is found on p. 7, lines 10-19. With respect to what low toxicity refers to, the specification provides the oral toxicity for rats for various compounds. It also states that bismuth is commonly given to humans. Toxicity values can be measured with respect to various animals. Low toxicity is intended to refer to toxicity in general, rather than with respect to a particular animal.

Contrary to the examiner's statement, trivalent chromium is a low toxicity compound. The Threshold Limit Value - Time Weighted Average (TLV-TWA) for humans for air exposure to trivalent chromium sulfate, trivalent chromium chloride, and trivalent chromium nitrate is 500 $\mu\text{g}/\text{m}^3$. In contrast, the TLV-TWA for CrO_3 , which is used in most plating operating, is 50 $\mu\text{g}/\text{m}^3$, an order of magnitude lower. In addition, hexavalent chromium is a known carcinogen via oral consumption, while trivalent chromium picolinate is a mineral supplement available on grocery store shelves.

These amendments have been made for reasons of clarity and for no other purpose. They do not narrow the claims because low toxicity compounds would include non-toxic compounds.

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The rejection of claims 13, 17, 40, and 43 under 35 U.S.C. § 103(a) as being unpatentable over France 2607489 and SU 1323537 is respectfully traversed. France 2607489 describes a process for the recovery of hexavalent chromium from plating wastes that already contain trivalent chromium oxide. The pH of the solution is raised with sodium hydroxide, the solution heated, and a precipitate is formed which removes up to 75 wt. % of the hexavalent chromium. It is noteworthy that the only reagent added is sodium hydroxide to raise the pH.

Trivalent chromium oxide reacts with sodium hydroxide to form trivalent chromium hydroxide $[\text{Cr}(\text{OH})_3]$. Trivalent chromium hydroxide is a known insoluble flocculating agent. It attracts other metal ions to it in solution via adsorption, thereby precipitating them by adsorption, including hexavalent chromium. Because adsorption is a far less efficient metal removal technique than the formation of insoluble compounds, it is not surprising that the highest efficiency of the process is 75%. If the inventors had added additional trivalent chromium, an increase in the process efficiency would have been noted due to the formation of more trivalent chromium chromate.

Sodium hydroxide is not a low toxicity precipitating agent for hexavalent chromium. A simple laboratory experiment will confirm this fact. If a 1.0 M chromium oxide (CrO_3) solution is prepared, and sodium hydroxide added, pHs up to 12 or 13 can be achieved with no precipitate formation. The alkaline pHs exhibited by aqueous sodium chromate solutions ($\text{CrO}_3 + \text{NaOH}$) with no precipitate formation is another indication that alkaline sodium solutions do not precipitate hexavalent chromium. Claim 13, and claims 17, 40, and 43 which depend from it, requires "reacting a soluble low toxicity precipitating agent with the hexavalent chromium to form an insoluble precipitating agent reagent-chromate precipitate." Trace amounts of trivalent chromium are present in the plating baths described by France 2607489, and it is the presence of the trivalent chromium which causes the precipitate, not the sodium hydroxide.

SU 1323537 describes a process wherein barium hydroxide is added to hexavalent chromium plating wastes in order to form an insoluble hexavalent chromium compound. It is

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noteworthy that prior addition of calcium hydroxide $[\text{Ca}(\text{OH})_2]$ or calcium oxide $[\text{CaO}]$ does not result in precipitate formation. It is only after the barium salt is added that precipitation occurs.

Barium is a toxic element whose use is coming under increased environmental legislation. Barium hydroxide is a reagent that results in death if ingested in small quantities. As stated in the specification on page 7, lines 10-12, "[o]nly a very limited number of metal ions form very insoluble chromates. Most of them, including lead, thallium, silver, barium, and mercury are themselves toxic which makes their use unacceptable." Thus, barium is not a low toxicity precipitating agent as claimed. Claim 13 requires "reacting a soluble low toxicity precipitating agent with the hexavalent chromium to form an insoluble precipitating agent reagent-chromate precipitate".

Thus, claims 13, 17, 40, and 43, as amended, would not have been obvious to one of ordinary skill in the art at the time the invention was made over France 2607489 and SU 1323537.

Applicants' gratefully acknowledge the examiner's indication that claims 1-12, 36, 39, 42, 26-35, 37, 38, 40, 41, and 44 appear to be allowable. In view of the amendments to claims 1 and 26, the claims are believed to be in allowable form.

The objection to claims 2-12, 14-16, 18-25, 27-39, 41, 42, and 44 is believed to have been overcome in view of the amendments to claims 1, 13, and 26.

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CONCLUSION

Applicants respectfully submit that, in view of the above amendment and remarks, the application is now in condition for allowance. Applicants respectfully request that claims 1-44 be passed to allowance.

If the Examiner has any questions or comments regarding the present application, he is invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,
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